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CORRELATION IN SEASONAL VARIATIONS OF WEATHER, VI.

SUNSPOTS AND PRESSURE.

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Correlation in Seasonal Variations of Weather VI.

Sunspots and Pressure.

The effect of sunspots on pressure has been discussed by Broun,* Blanford† and Hann;‡ but the data handled were somewhat limited and it cannot be claimed that any general result has been completely established. Fairly good evidence was however given by Blanford for the view that at times of many sunspots the pressure in the Indomalay region is high, while that in European Russia and western Siberia is low. His suggestion for the explanation was that at such times the Indian rainfall is more abundant, and consequently that air is light and rises in greater quantities there, descending as dry air where the production of water vapour is a minimum, *i.e.*, in the cooler regions of the moderate zones, especially where a cold dry surface of land is quickly losing heat under a clear winter sky.

2. In the following paper the data are, for the reasons previously given,§ for the most part limited to years subsequent to 1850, as well as to the data of single stations. The pressures have in cases that appeared doubtful been plotted and compared with those of neighbouring stations excepting those extracted from Hann's classical table in Penck's Geographische Abhandlungen.‖ In certain cases, especially where aneroid barometers were in use, it has been found that the earliest records showed departures from normal very much larger than those of years of reliable data, and in such cases the data have been rejected for present purposes.

The data are given in Table II, the correlation co-efficients in Table I, and the latter are charted in the accompanying plate.

With the object of facilitating verification the data in Table II are given with as little change as possible from the data in the tables from which they are compiled. If the originals are not reduced to constant gravity they are not reduced in Table II. If the originals are not reduced to sea level and changes have occurred from time to time in the altitudes of the barometers above sea level, the data of Table II have been reduced to the present altitude; thus in the Russian data the actual changes in altitude due to removals have been allowed for, but not the apparent changes due merely to fresh determinations of the height above sea level.

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* 'Die Beziehungen der Sonnenflecken zu den magnetischen und meteorologischen Erscheinungen der Erde'. Natuurk. Verh. d. Holl. Maatsch. d. Wetensch. 3de Verz. Deel III, Haarlem, 1878, pages 177-184.

† Nature, March 18, Vol. 21, 1880; also printed in Zeitschr. fur Meteorologie XV, pages 153-158. Also in the latter volume pages 393-397.

‡ In the last mentioned volume pages 159-162.

§ See Correlation in seasonal variations of weather IV, page 18.

‖ 'Die Vertheilung des Luftdruckes'. Band II, Heft 2. Wien. 1887. I do not consider that Brückner has made out a strong enough case for altering Hann's data of Stykkisholm and Barnaul. See the remarks on pages 197-8 of his Klimaschwankungen. It appears to me from a comparison of Stykkisholm with Jacobshavn, Thorshavn and Greenwich that Stykkisholm was low between 1889 and 1990 to an average extent comparable with that from 1850 to 1866, also there is no sudden discontinuity between 1865 and 1866. In the case of Barnaul I have relied on a comparison of its curves with those of Eniseisk, Irkutsk and Nikolaevsk, as well as of Ekaterinburg and Nertchinsk.

3. It would be premature to attempt a complete discussion of the causes that produce the pressure relationships until the data of certain other elements have been analysed, especially those of sunspots with the meteorological elements in summer and winter; but it may be of interest to make a preliminary survey of the chief features.

4. It is a striking fact that the region of negative co-efficients extends from India over a considerable area, including northern Africa, east and south Africa, Arabia, Persia, Java and Australia. Europe, except in its most southern districts, Siberia, the China coast and Japan appear to have positive co-efficients. As might be expected from the opposition in pressure between the Argentine or Chili and India the co-efficients in the former countries are strongly positive; and in the east coast districts of North America positive co-efficients prevail, though in the west there is a tendency towards negative values. In the Pacific (*e.g.*, Honolulu and Wellington) the relationship appears to be generally positive, but in the Atlantic there is a negative region including Iceland, Scotland and the North Sea.

A comparison of the chart with the corresponding chart in a previous paper for sunspots and rainfall will bring out the general tendency for the pressure co-efficients to be opposite in sign to rainfall co-efficients; and it may be inferred that the variations of pressure and rainfall are to a large extent dominated by the same cause, being to a comparatively small extent affected by variations of temperature. For instance in the Argentine and Chili *both* pressure and rainfall are opposite in their relations with sunspots to those of India, while temperatures in all these regions have the same marked negative relationship. From this last too it may be inferred that the relationship between sunspots and temperature is brought about rather by excess of humidity in the air, at any rate in its higher levels, than by excess of rain. In coast regions with tendency at times of maximum sunspots to diminished pressure and increased rain the natural explanation lies in an increased flow of moist air from sea to land.

5. As was pointed out by Brückner in his Klimaschwankungen* we should expect an increase of solar radiation to be associated with a fall of pressure in equatorial regions and a rise in those areas where the air descends that has ascended near the equator. In other words we should expect an accentuation of those features which are due to the sun's heating. If we consult a chart of annual isobars of the world† we may pick out as the chief of these features:—

(*a*) A fall in the equatorial regions including India.

(*b*) A fall near Iceland and the Aleutian Islands.

(*c*) A rise near Honolulu, the Azores, and central Siberia.

(*d*) A rise in the south Indian Ocean, the south Atlantic and south Pacific, in all three cases about latitude 30°.

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* Page 239.

† See for instance Plate 11 in Bartholomew's Atlas of Meteorology.

When examining the blue shading on the correlation chart it must be remembered that this has been drawn on a purely geometrical consideration of the comparatively few stations available, without any straining towards a physical interpretation. It will then be seen that (*a*) holds for the eastern hemisphere, and may hold partially at any rate in the western. Of (*b*) the first half holds; there are no data for the Aleutian Islands. Of (*c*) the first two hold, but the rise in Siberia does not extend far enough south. Of (*d*) the rise in the south Pacific appears on the chart but instead of that in the south Atlantic and India oceans we have indications of a fall. Thus the chief discrepancy lies in a fall over a larger area than might be expected in the southern half of the eastern hemisphere. If ·15 were added to the co-efficients of the eastern hemisphere and subtracted from those of the western the general agreement would be improved.

Associated with a rise of pressure at the Azores and fall in Iceland there is known to be a rise of temperature in northwest Europe with more rain, at any rate in winter; and these two features are shown on the corresponding charts.

6. Among the areas most conspicuous for increases of rain with sunspots will be found, in addition to northwest Europe, India, the north and east coast districts of Australia which form the area of their summer monsoon rains, the northwest of the United States, the west coast of northern Africa, and the eastern districts of south Africa. Considering first the India monsoon rains, which are brought by moist winds from the Indian Ocean it is interesting to note that these are associated with less rain in that ocean and a stronger gradient between the ocean and India: Similarly the increase of Australian rain is probably associated with a decrease of rain in the seas to its north and an increase of gradient from the Chinese seas and the Philippines to Australia. The increase of rain in the northwest of the United States also is accompanied by a decrease of rain in the north Pacific as represented by Honolulu and an increase of gradient thence to the land. The cases of increased rainfall in Africa may also be associated with increased gradients, but here data are lacking.

These cases cannot be regarded as satisfactorily explained until the statistics for summer and winter have been separately calculated, but they at any rate lend support to the interpretation in terms of increased radiation.

7. Among the difficulties left unexplained is the tendency in the Mediterranean and Syria towards diminished rainfall in spite of diminished pressure. But as in this area the rainfall occurs mainly in the winter months it may be that the features of pressure at that time are masked by the features during the rest of the year.

8. Perhaps I may be permitted to express the hope that as opportunities occur, the weather departments of the different countries will prepare and print collections of revised monthly data of pressure, temperature and rain for all their chief observatories. In many cases they can form a better idea than an outside department of the extent to which observations are reliable, and it is much better that authoritative tables should be published once for all rather than that each investigator should have to prepare his own tables. I believe that methods of seasonal forecasting can only be developed on the bases of a statistical examination of the past monthly and annual data; and progress will be very greatly facilitated if these verified collections are made easily accessible.

TABLE I.

Correlation Co-efficients of sunspots and annual pressure.

Station.	Country.	Number of years	Correlation co-efficient with sunspots.	Latitude.	Longitude.
A					
Abbassia	Egypt	42	—·20	30° 5′ N	31° 17′ E
Adelaide	South Australia ...	55	—·31	34° 57′ S	138° 35′ E
Aden	Arabia	32	—·18	12° 45′ N	45° 3′ E
Agra	India	39	0	27° 10′ N	78° 5′ E
Albany, N. Y. ...	United States of America	39	+·21	42° 39 N	73° 45′ W
Albany ...	West Australia ...	24	—·17	35° 2′ S	117° 52′ E
Algiers	Algeria	24	—·10	36° 48′ N	3° 2′ E
Alice Springs ...	South Australia ...	31	—·30	23° 38′ S	133° 37′ E
Archangelsk ...	Russia	34	—·08	64° 33′ N	40° 32′ E
Astrachan	„	30	—·03	46° 21′ N	48° 2′ E
Auckland	New Zealand ...	27	+·14	36° 50′ S	174° 51′ E
B					
Baghdad	Asiatic Turkey ...	17	—·20	33° 19′ N	44° 26′ E
Bahia	Brazil	20	—·09	12° 54′ S	38° 24′ W
Barbados	West Indies ...	20	+·15	13° 8′ N	59° 60′ W
Barnaul	Siberia	57	+·05	53° 20′ N	83° 47′ E
Basel	Switzerland ...	62	+·00	47° 33′ N	7° 35′ E
Batavia	Java	46	—·27	6° 11′ S	106° 50′ E
Bermuda	Bermudas ...	20	—·03	32° 18′ N	64° 47′ W
Blumenau ...	Brazil	20	—·43	26° 55 S	49° 3′ W
Bombay	India	64	—·37	18° 54′ N	72° 49′ E
Bordeaux	France	18	+·16	44° 50′ N	0 31′ W
Brisbane	Queensland ...	27	—·30	27° 28′ S	153° 6′ E
Buenos Aires ...	Argentina ...	42	+·24	34° 36′ S	58° 22′ W
Bushire	Persia	34	—·12	28° 59′ N	50° 49′ E
C					
Calcutta	India	59	—·27	22° 32′ N	88° 20′ E
Cape Town ...	Cape Colony ...	55	—·47	33° 56′ S	18° 29′ E
Carnarvon... ...	West Australia ...	22	—·21	24° 42′ S	113° 39′ E

Station.	Country.	Number of years.	Correlation co-efficient with sunspots.	Latitude.	Longitude.
C—*contd.*					
Colombo	Ceylon	44	—·38	6° 56′ N	79° 52′ E
Cordoba	Argentina ...	41	+·12	31° 25′ S	64° 12′ W
Cristiansund ...	Norway	45	—·01	63° 7′ N	7° 45′ E
D					
Denver, Colo. ...	United States of America	40	—·15	39° 45′ N	105° 0′ W
Derby	West Australia ..	20	—·28	17° 18′ S	123° 39′ E
Durban	Natal	34	—·19	29° 51′ S	30° 30′ E
E					
Ekaterinburg ...	Russia	57	+·26	56° 50′ N	60° 38′ E
Eniseisk	Siberia	34	+·08	58° 27′ N	92° 11′ E
G					
Galveston, Tex. ...	United States of America	40	+·30	29° 18′ N	94° 50′ W
Greenwich... ...	British Isles ...	58	—·09	51° 29′ N	0
H					
Hamburg ...	Germany ...	36	+·13	53° 33′ N	9° 58′ E
Helena, Mont. ...	United States of America	31	—·07	46° 34′ N	112° 4′ W
Hong Kong ...	China	28	+·28	22° 18′ N	114° 11′ E
Honolulu	Hawaii Island ...	30	+·25	21° 18′ N	157° 50′ W
I					
Irkutsk	Siberia	35	—·14	52° 16′ N	104° 19′ E
J					
Jacobshavn ...	Greenland ...	47	+·22	69° 13′ N	51° 2′ W
Jakutsk ...	Siberia	19	+·23	62° 1′ N	129° 43′ E
K					
Key West, Fla. ...	United States of America	40	+·20	24° 34′ N	81° 49′ W
L					
Leh	India	34	—·27	34° 10′ N	77° 42′ E
Lisbon	Portugal	56	—·18	38° 43′ N	9° 9′ W
Lugansk	Russia	34	—·04	48° 35′ N	39° 20′ E

Station.	Country.	Number of years.	Correlation co-efficient with sunspots.	Latitude.	Longitude.
M					
Madras	India	64	—·28	13° 4′ N	80° 14′ E
Mahe (see Seychelles) ...	...	...	...	...	...
Manila	Philippine Islands ...	34	+·02	14° 35′ N	120° 58′ E
Mauritius (see Port Louis)	...	....	...	...	...
Mexico	Mexico	34	+·04	19° 26′ N	99° 8′ W
Moskow	Russia	38	+·04	55° 45′ N	37° 40′ E
N					
Nagasaki	Japan	26	+·14	32° 44′ N	129° 52′ E
Nashville, Tenn. ...	United States of America	40	0	36° 10′ N	86° 47′ W
Nertchinsk (Zavod) ...	Siberia	56	+·05	51° 19′ N	119° 37′ E
Newcastle	Jamaica	23	—·13	18° 0′ N	76° 42′ W
Nikolaevsk ...	Siberia	24	+·23	53° 8′ N	140° 46′ E
P					
Palermo	Italy	49	—·09	38° 7′ N	13° 21′ W
Para	Brazil	15	+·29	1° 27′ S	48° 29′ W
Pelotas	„	15	+·36	31° 49′ S	52° 12′ W
Perth	West Australia ...	29	—·18	31° 57′ S	115° 52′ E
Petrograd	Russia	58	+·16	59° 56′ N	30° 16′ E
Ponta Delgada ...	Azores	19	+·21	37° 45′ N	25° 41′ W
Port Darwin ...	South Australia ...	32	—·32	12° 28′ S	130° 51′ E
Port Louis ...	Mauritius ...	39	—·09	20° 6′ S	57° 33′ E
Punta Arenas ...	Chili	19	—·05	53° 10′ S	70° 54′ W
R					
Rangoon... ...	India	38	—·16	16° 46′ N	96° 12′ E
Rio-de-Janeiro ...	Brazil	59	—·27	22° 54′ S	43° 10′ W
S					
St. Helena... ...	St. Helena ...	16	—·09	15° 55′ S	5° 43′ W
San Diego, Cal. ...	United States of America	40	+·02	32° 45′ N	117° 10′ W
Santiago	Chili	53	+·35	33° 27′ S	70° 41′ W
Scutari	Asia Minor ...	38	+·13	41° 0′ N	29° 3′ E
Seychelles	Seychelles ...	19	0	4° 45′ S	55° 45′ E

Station.	Country.	Number of years.	Correlation co-efficient with sunspots.	Latitude.	Longitude.
S– *contd.*					
Sierra Leone ...	Senegambia ...	20	+·03	8° 30′ N	13° 9′ W
Stykkisholm ...	Iceland	63	−·04	65° 5′ N	22° 46′ W
Sydney	New South Wales ...	55	−·07	33° 52′ S	151° 12′ E
Sydney	Nova Scotia ...	36	+·29	46° 10′ N	60° 10′ W
T					
Tashkent	Siberia	33	−·05	41° 20′ N	69° 18′ E
Thorshavn ...	Faroe Island ...	46	−·07	62° 22′ N	6° 44′ W
Tiflis	Russia	58	−·02	41° 43′ N	44° 48′ E
Tokio	Japan	39	+·12	35° 41′ N	139° 45′ E
Toronto	Canada	63	−·10	43° 29′ N	79° 23′ W
V					
Valencia	Ireland	45	+·03	51° 56′ N	10° 15′ W
Vardö	Norway	47	+·04	70° 22′ N	31° 8′ E
Victoria, B. C. ...	Canada	21	−·09	48° 24′ N	123° 19′ W
Vienna	Austria	60	+·08	48° 15′ N	16° 21′ E
W					
Warsaw	Russia	59	+·13	52° 13′ N	21° 2′ E
Washington, D. C. ...	United States of America	40	+·19	38° 54′ N	77° 3′ W
Winnipeg, Man. ...	Canada	20	−·17	49° 51′ N	97° 7′ W
Z					
Zanzibar	British East Africa ...	22	−·46	6° 10′ S	39° 11′ E
Zi-ka-Wei... ...	China	36	+·13	31° 12′ N	119° 6′ E

TABLE II.

Data of Annual Pressure.

ABBASSIA 30° 5′N 31° 17′E

Mean of observations every 3 hours reduced to 0°C and altitude 29·9 in. Grav. corr. not applied. 750 mm. +

	0	1	3	4	5	6	7	8	9
186-	...	...	...	...	...	...	...	...	8·56
187-	8·16	8·76	8·86	8·96	9·10*	8·36	8·96	9·06	9·20	8·97
188-	9·21	9·06	9·88	9·38	9·62	8·84	9·01	8·66	8·95	8·98
189-	8·62	9·20	8·68	·8·81	8·54	8·80	9·04	9·71	9·76	9·44
190-	8·81	9·1	9·2	10·0	8·28	9·73	9·70	9·74	9·90	9·74
191-	9·64									

Metl. Repts. Egypt.

ADELAIDE 34° 57′S 138° 35′E.

9 A.M., reduced to 32°F., sea-level and standard gravity, 30"+

	0	1	2	3	4	5	6	7	8	9
185-	...	...	...	...	...	...	...	·067	·043	·077
186-	·054	·016	·030	·011	·065	·078	·067	·034	·083	·067
187-	·026	·031	·037	·067	·050	·033	·082	·147	·061	·058
188-	·071	·111	·053	·063	·079	·126	·080	·071	·118	·062
189-	·040	·117	·057	·027	·071	·074	·085	·080	·045	·089
190-	·060	·084	·100	·051	·081	·082	·048	·053	·118	·046
191-	·049	·065	·071	·093	...	...	...	...	...	...

1857-1875 Mss. from Sir Charles Todd given in "Barometric pressure for 73 selected stations" by Sir N. Lockyer, by applying the corr. of +·005 derived from the data 1876-05.

1876-1913 Mss. received from the Director.

ADEN 12° 45′N 45° 3′E.

8 A.M., reduced to 32°F. and standard gravity. Altitude = 94 ft. 29"+

	0	1	2	3	4	5	6	7	8	9
188-	...	·760	·760	·761	·777	—	·743	·758	·768	·756
189-	·747	·768	·734	·748	·761	·752	·765	·757	·735	·776
190-	·765	·766	·743	·765	·760	·767	·773	·773	·778	·757
191-	·754	·766	·778	·777						

Deptl. records.

AGRA 27° 10′N 78° 5′E.

8 A.M., reduced to 32°F. and standard gravity. Altitude = 556 ft. 29"+

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	...	...	·212	·211	·254	·247	·231
188-	·228	·230	·228	·230	·244	·271	·257	·210	·256	·247
189-	·234	·264	·221	·255	·219	·234	·226	·222	·204	·223
190-	·234	·230	·238	·229	·215	·238	·234	·231	·218	·228
191-	·212	·216	·238	·242						

Deptl. records.

ALBANY, N. Y. 42° 39′N 73° 45′W.

Mean of 24 hrs. reduced to 32°F., and standard gravity. Altitude=97 ft. 29″ +

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	...	·905	·915	·891	·914	·838	·929
188-	·937	·922	·945	·953	·922	·900	·932	·934	·925	·913
189-	·928	·935	·909	·901	·934	·913	·934	·934	·924	·937
190-	·909	·878	·893	·925	·944	·929	·955	·916	·928	·901
191-	·896	·947	·899	...	...	...	...	...	...	...

Repts. of Chief of Wthr. Bur. Washington.

ALBANY (W. Aust.) 35° 2′S 117° 52′E.

Mean of 9 A.M., and 3 P.M., reduced to 32°F. and sea-level. Grav. corr. not applied. 30″ +

	0	1	2	3	4	5	6	7	8	9
188-	...	...	...	...	...	·093	·071	·073	·096	·026
189-	·036	·108	·056	·010	·076	·058	·058	·056	·021	·056
190-	·062	·078	·077	·037	·045	·089	·018	·021	·059	...

W. Australia Metl. Repts. Perth.

ALGIERS (HOTEL-DE-VILLE) 36° 48′N 3° 2″E.

Mean of 7, 13 and 17 hours reduced to 0°C. Altitude=38·5 m. Grav. corr not applied. 750 mm.+

	0	1	2	3	4	5	6	7	8	9
188-	...	...	...	...	...	...	...	...	9·71	9·24
189-	8·90	9·66	8·26	9·12	9·45	8·21	9·70	9·58	9·10	9·56
190-	9·16	8·83	9·52	10·38	9·64	10·07	9·38	9·63	10·00	9·23
191-	9·46	9·96	...	...	...	...	...	...	...	...

Anns. Bur. Centr. Metl. de France.

ALICE SPRINGS. 23° 38′S 133° 37′E.

9 A.M., reduced to 32°F., sea-level and standard gravity. 29″ +

	0	1	2	3	4	5	6	7	8	9
188-	...	1·002	·962	·999	1·000	1·038	·997	·999	1·037	1·000
189-	...	...	·965	·940	·985	1·006	·994	1·001	·965	1·003
190-	·995	1·010	1·025	·979	1·007	1·034	·977	·991	1·006	·978
191-	·973	·981	·999	1·006	...	...	...	...	...	...

Mss. received from the Director.

ARCHANGELSK 64° 33′N 40° 32′E.

Reduced to 0°C, altitude 6·7 m. and standard gravity. 750 mm. +

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	...	...	8·3	8·0	8·6	5·7	8·6
188-	5·4	8·0	8·5	9·3	9·4	8·5	9·3	7·2	8·4	11·3
189-	10·6	9·6	8·3	6·3	7·3	8·8	9·8	10·1	9·2	7·9
190-	9·3	9·3	8·1	8·1	9·5	8·3	9·5	10·4	8·6	...

Anns. de l'Obs. Phys. Centr. de Russie.

ASTRACHAN 46° 21′N 48° 2′E.

Reduced to 0°C. altitude—13·8 m. and standard gravity. 750 mm. +

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	...	...	...	14·9	15·6	14·0	14·6
188-	14·8	14·7	14·6	15·5	15·2	15·3	...	...	...	15·6
189-	14·9	15·0	13·7	14·0	15·8	14·3	15·1	15·1	15·4	14·3
190-	15·3	15·0	14·9	15·4	15·6	15·4	14·6	15·8	15·6	...

Anns. de l'Obs. Phys. Centr. de Russie.

AUCKLAND 36° 50′S 174° 51′E

9-30 A.M., reduced to 32°F., and sea-level. Grav. corr. not applied. 29"+

	0	1	2	3	4	5	6	7	8	9
185-	...	...	...	...	·964	1·018	·994	·979	1·004	1·008
186-	·990	1·012	...	...	...	...	...	...	1·019	...
187-	1·015	·967	1·024	·981	·952	·988	·978	1·021	·995	·990
188-	1·009	1·000	...	1·036	...	...	...	...	1·052	...

1854-61 Metl. Obns. Foreign and Col. stations. 1852-86 London 1890 pp. 254, 256.
1868-1888 Metl. annual Summaries, New Zealand.

BAGHDAD 33° 19′N 44° 26′E.

8 A. M. reduced to 32° F. Altitude—127ft. Grav. corr. not applied. 29"+

	0	1	2	3	4	5	6	7	8	9
189-	...	...	...	...	...	...	·763	·772	·785	·795
190-	·788	·788	·775	·800	·780	·796	·774	·784	...	·760
191-	·763	·782	·791	·798	...	...	...	...	...	...

Deptl. records.

BAHIA 12° 54′S 38° 24′W.

Reduced to 0°C and sea-level. Grav. corr. not applied. 750 mm.+

	0	1	2	3	4	5	6	7	8	9
188-	...	12·34	10·14	10·82	10·20	10·49	9·18	12·39	13·03	13·46
189-	14·45	12·01	12·75	12·43	12·56	13·32	13·26	12·26	12·32	11·45
190-	...	12·82	...	...	...	...	...	...	...	...

Bol. Men. do Obs. Rio-de-Janeiro 1901, p. 99.

NOTE.—The year's pressure includes from 1st April of the year to the 31st March of the succeeding year.

BARBADOS 13° 8′N 59° 40′W.

9 A.M. reduced to 32°F. and altitude 31ft. Grav. corr. not applied. 29"+

	0	1	2	3	4	5	6	7	8	9
187-	...	1·012	1·015	1·026	...	...	1·029	1·018	1·017	·998
188-	1·022	...	...	1·039	1·002	...	·978	1·000	1·005	·996
189-	1·020	1·017	1·011	·996	1·053	1·025	1·040	1·007	1·017	1·026
190-	1·016	1·017	1·027	1·023	1·019	...	...	...	...	...

Army Med. Dept. Repts. London.

BARNAUL 53° 20′N 83° 47′E.

Reduced to 0°C, altitude 165 m. and standard gravity. 740 mm +

	0	1	2	3	4	5	6	7	8	9
185-	...	10·1	10·4	10·5	9·6	9·6	9·3	8·9	9·1	10·1
186-	11·2	...	9·9	8·4	10·3	9·5	10·1	9·8	10·6	11·2
187-	10·0	9·6	9·1	9·5	10·5	10·0	9·9	12·4	11·5	10·0
188-	10·6	10·7	11·0	11·6	11·0	10·8	11·2	9·7	9·6	11·7
189-	9·7	10·1	11·8	10·9	10·4	11·2	10·5	11·5	10·8	11·5
190-	11·8	10·9	9·8	10·5	10·7	10·3	10·6	10·6	10·0	

Anns. de l'Obs. Phys. Centr. de Russie.

BASEL 47° 33′N 7° 35′E.

Mean of 7, 13, 21 hours reduced to 0°C. Altitude=278 m. Grav. corr. not applied. 730 mm +

	0	1	2	3	4	5	6	7	8	9
185-	8·68	8·77	7·64	6·06	9·33	6·88	7·78	9·19	8·93	8·71
186-	6·66	8·88	7·91	9·62	7·46	8·35	8·04	8·35	8·64	8·40
187-	7·93	8·31	6·45	8·39	8·93	8·57	7·20	7·79	7·74	7·63
188-	8·96	8·23	8·99	8·73	9·15	7·48	7·2	8·5	8·1	8·0
189-	8·3	8·8	7·5	8·8	8·9	6·5	8·5	8·4	8·5	8·8
190-	7·2	7·2	7·7	8·2	8·3	8·4	8·0	8·2	9·1	7·4
191-	6·6	8·8								

1850-1885 Hann's paper in Penck's Geogr. Abh. II, 2 pp. 204,5.

1886-1911 Ann. d. Schweiz. Metn. Zürich.

BATAVIA 6° 11′S 106° 50′E.

Hourly mean reduced to 0°C. Grav. corr. not applied. 750 mm +

	0	1	2	3	4	5	6	7	8	9
186-	...	...	...	...	...	...	8·84	8·86	9·21	9·00
187-	8·14	8·48	8·19	8·46	8·57	8·43	8·64	9·77	8·69	8·18
188-	8·79	8·87	8·57	8·90	9·01	9·21	8·45	8·51	9·15	8·79
189-	8·64	9·16	8·36	8·52	8·71	8·72	9·08	8·80	8·30	8·95
190-	8·97	8·92	9·12	8·11	8·74	9·27	8·64	8·72	8·51	8·39
191-	8·27									

Magn. and Metl. Obns. Batavia and mss.

BERMUDA 32° 18′N 64° 47′W.

9 A.M. reduced to 32° F. and altitude 151 ft. Grav. corr. not applied. 29″+

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	...	992	·983	·954	·946	·906	·977
188-	...	·913	·964	·959	·935	...	·944	·912	·948	·949
189-	·994	·948	942	·939	·895	·946	·959	·961	·944	·946
190-	·952	·890	·897	·943	·949					

1874-1884 Metl. Obns. Foreign and Col. stations. 1852—86, London 1890, pp. 40-45.

1886-1904 Army Med. Dept. Repts, London.

BLUMENAU 26° 55′S 49° 3′W.

Reduced to 0°C and sea-level. Grav. corr. not applied. 750 mm+

	0	1	2	3	4	5	6	7	8	9
188-	...	...	...	...	...	...	...	...	9·7	10·8
189-	11·9	10·4	8·1	8·5	8·8	8·8	9·4	10·1	10·1	10·9
190-	10·3	11·5	11·2	12·9	11·9	11·8	11·8	11·8		

Bol. Men. do. Obs. Rio-de-Janeiro, 1908, pp. 32-39.

BOMBAY 18° 54′N 72° 49′E.

8 A.M. reduced to 32° F. and standard gravity. Altitude=37 ft. 29″+

	0	1	2	3	4	5	6	7	8	9
184-	...	...	...	...	...	...	...	·792	·800	·793
185-	·803	·791	·800	·809	·799	·810	·801	·803	·807	·807
186-	·790	·792	·778	·787	·827	·803	·817	·810	·831	·809
187-	·792	·800	·790	·806	·805	·812	819	·818	·801	·805
188-	·822	·825	·811	·816	·830	·826	·812	·821	·836	·815
189-	·810	·820	·787	·812	·805	·817	·818	·808	·795	·820
190-	·824	·820	·818	·807	·818	·833	·814	·809	812	·800
191-	·792	·821	·813	·811						

Depth records

BORDEAUX 44° 50′ N, 0° 31′ W.

Hourly mean reduced to 0°C. Altitude=73·7 m Grav. corr. not applied. 750 mm.+

	0	1	2	3	4	5	6	7	8	9
189-	...	...	...	...	7·25	4·78	7·73	7·03	7·15	6·96
190-	6·18	6·12	6·46	6·87	6·89	7·60	7·16	6·88	7·72	6·09
191-	5·71	7·12								

Anns. Bur. Centr Metl. de France.

BRISBANE 27° 28′S 153° 0′ E.

9 A. M. reduced to 32°F., sea level and standard gravity. 29″+

	0	1	2	3	4	5	6	7	8	9
188-	...	...	...	...	...	...	...	1·025	1·032	1·033
189-	·994	1·031	·987	·963	1·022	1·038	1·046	1·017	1·020	1·045
190-	1·046	1·032	1·070	1·044	1·047	1·051	1·059	1·029	1·056	1·053
191-	1·034	1·027	1·017	1·038						

Mss. received from the Director.

BUENOS AIRES 34° 36′ S 58° 22′W.

Mean of 24 hours reduced to 0°C. Altitude=22 m. Grav. corr. not applied. 750 mm+

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	...	11·53	10·61	10·13	9·52	10·09	9·90
188-	9·48	9·50	10·05	9·85	9·87	9·85	10·21	9·79	9·67	10·13
189-	10·36	10·16	10·76	11·05	10·69	10·29	10·77	11·06	10·32	9·69
190-	9·99	10·64	9·92	10·07	10·22	9·73	9·73	10·21	10·69	10·51
191-	10·35	10·41	10·23	9·96						

Mss. received from the Director.

BUSHIRE 28° 59′ N 50° 49′ E.

8 A. M. reduced to 32° F., and standard gravity. Altitude=14 feet. 29"+

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	...	...	...	...	...	...	·795
188-	·824	·811	·830	·816	·829	·831	812	·821	·826	...
189-	·815	·837	·804	·814	·820	·825	·840	·837	·823	·837
190-	·834	·834	·830	·839	827	·836	·819	·814	·813	·792
191-	·806	·813	·825	·823						

Deptl. records.

CALCUTTA 22° 32′ N 88° 20′ E.

8 A. M. reduced to 32° F., and standard gravity. Altitude=21 feet. 29"+

	0	1	2	3	4	5	6	7	8	9
185-	...	...	...	...	...	·783	·771	·762	·773	·784
186-	·756	·753	·759	·752	·787	·794	·779	·798	·798	·782
187-	·765	·765	·774	·767	·780	·767	·766	·820	·791	·764
188-	·774	·772	·761	·767	·782	·790	·778	·762	·775	·775
189-	·767	·765	·761	·782	·764	·783	·768	·773	·759	·778
190-	·788	·780	·796	·781	·770	·792	·777	·768	·771	·772
191-	·764	·767	·781	·780						

Deptl. records.

CAPETOWN 33° 56′S 18° 29′E.

Daily mean reduced to 32 F., sea level and standard gravity. 29"+

	0	1	2	3	4	5	6	7	8	9
184-	...	...	1·036	1·046	1·033	1·057	1·036	1·036	1·004	1·027
185-	1·009	1·023	1·038	1·047	1·049	1·052	1·043	1·039	1·039	1 024
186-	1·023	1·016	·993	1·031	1 030	1·035	1 036	1 038	1·043	1·034
187-	1·013	1 021	1·013	1 013	1·044	1 032	1·052	1.032	1·029	1·029
188-	1·048	1·050	1·042	1·026	1 049	1·028	1·022	1·043	1·029	1·035
189-	1·029	1·030	1·018	1·019	1·024	1·017	1·037	1·045	1·026	1·029
190-	1·022	1·039	1·023	1 046	1·037					

The barometer in South Africa by R. T. A. Innes, 1907.

CARNARVON 24° 42′ S 113° 39′E.

Mean of 9 A. M. and 3 P. M., reduced to 32° F., and sea level. Grav. corr. not applied. 29"+

	0	1	2	3	4	5	6	7	8	9
188-	...	...	...	...	...	·980	·940	·962	·987	·964
189-	·951	998	·960	·932	·940	...	·973	·962	...	·984
190-	1·002	1·004	1·019	·966	·997	1·024	·989	·994	·999	

W. Australia Metl. Repts. Perth.

COLOMBO 6° 56′N 79° 52′E.

8 A. M., reduced to 32° F. and standard gravity. Altitude = 40 ft. 29″+

	0	1	2	3	4	5	6	7	8	9
187-	·800	·811	·798	·814	·822	·814	·820	·856	·818	·812
188-	·828	·822	·822	·820	·833	·832	·812	·821	·813	·826
189-	·822	·833	·805	·817	·817	·817	·827	·818	·805	·837
190-	·810	·832	·837	·822	·840	·838	·820	·822	·818	·811
191-	·798	·820	·817	·817						

Deptl. records.

CORDOBA 31° 25′ S 64° 12′ W.

Mean of 24 hours reduced to 0°C. Altitude=438 m. Grav. corr. not applied. 720 mm.+

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	3·74	4·72	4·75	4·32	3 55	4·52	4·36
188-	3·70	3 74	4 05	3·90	3 85	4·02	4·72	4·17	3·66	4·57
189-	4·69	4·11	4·79	5·23	4·70	4·21	4·31	4·82	4 00	3·35
190-	3·51	3 94	3·57	4·33	4·14	4·37	4·54	4·70	4·98	5·14
191-	4·82	4·58	4 64	4 35						

Mss. received from the Director.

CRISTIANSUND 63° 7′ N 7° 45°E.

Daily mean reduced to 0°C., altitude 17·8 m. and standard gravity. 760 mm +

	0	1	2	3	4	5	6	7	8	9
186-	...	...	...	...	...	...	3·0	6·0	4·4	4·4
187-	7·3	6 7	5·2	5 0	4·8	5·8	6·5	4·0	5·2	7·0
188-	6·4	7·0	5·0	6 0	6·4	5·1	5·0	6·2	6·0	7·1
189-	6·5	6 7	5 6	5·2	5·6	6·5	7·1	6 0	5·2	6 0
190-	6 2	...	6·8	4·1	6·3	6·0	...	5·7	7·6	5 3
191-	4·6	6·6	4·8							

1866-1895 Klima Tabeller for Norge 1896, p. 74.

1896-1912 Jahrb. Norweg. Metn. Inst.

CURYTIBA 25° 20′S 49° 30′W.

Reduced to 0 C. 680 mm +

	0	1	2	3	4	5	6	7	8	9
190-	7·2	6 9	6 6	7·2	6·9	6·8	7 0	6·7	7·4	7·2
191-	6·1	6 8	7·4	...	...	...	...	...	...	...

Mss. from the Director, Rio-de-Janeiro.

CUYABA 15° 36′S 56° 0′W.

Reduced to 0°C. 740 mm+

	0	1	2	3	4	5	6	7	8	9
190-	...	5·4	5·3	5·3	5·2	5·4	4·7	5·2	5·6	5·3
191-	4·8	5·7	6 3							

Mss. from the Director, Rio-de-Janeiro.

GALVESTON, TEX 29° 18′N 94° 50′W.

Mean of 24 hours reduced to 32°F and standard gravity. Altitude = 54 ft. 29″.

	0	1	2	3	4	5	6	7	8	9
187-	...	...	..	·977	·981	·975	·984	·961	·965	·955
188-	·951	·942	·960	·967	·952	·971	·956	·967	·959	·980
189-	·983	·976	·983	·969	1·001	·995	·992	·976	·949	·945
190-	·941	·946	·924	·963	·966	·978	·989	·986	·994	·973
191-	1·006	1·001	·987							

Repts. of Chief of Wthr. Bur., Washington.

GREENWICH, 51° 29′ N 0°.

Mean of 24 hours reduced to 32°F. Altitude=159 ft. Grav. corr. not applied. 29″+

	0	1	2	3	4	5	6	7	8	9
185-	...	...	...	...	·818	·780	·774	·820	·836	·772
186-	·699	·798	·766	·810	·798	·783	·714	·796	·789	·790
187-	·806	·790	·636	·780	·805	·813	·719	·725	·752	·771
188-	·809	·778	·757	·783	·813	·753	·734	·810	·777	·791
189-	·790	·787	·773	·816	·793	·749	·817	·800	·817	·819
190-	·757	·789	·798	·750	·801	·826	·807	·794	·841	·768
191-	·712	·825								

Magn. and Metl. Obns., Greenwich.

HAMBURG 53° 33′N 9° 58′E

Mean of 8, 14 and 20 hours reduced to 0°C and altitude 26 m. Grav. corr. not applied. 750 mm+

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	...	...	...	9·56	7·00	7·60	8·29
188-	8·93	9·10	8·30	8·70	9·50	8·22	7·57	8·95	7·99	8·0
189-	8·4	8·5	7·5	8·3	8·2	7·2	9·2	8·8	8·3	8·5
190-	7·3	8·0	8·4	7·3	8·6	8·7	...	9·1	10·3	8·2
191-	7·0	9·7	8·0							

Metn. Beob. in Deutschland Hamburg.

HELENA, MONT. 46° 34′N 112° 4′W.

Mean of 24 hours reduced to 32°F. and standard gravity. Altitude = 4,110 ft. 25″+

	0	1	2	3	4	5	6	7	8	
188-	...	...	·784	·808	·783	·781	·785	·766	·806	·802
189-	·787	·768	·777	·768	·775	·795	·768	·795	·803	·775
190-	·794	·798	·762	·800	·794	·816	·810	·797	·806	·763
191-	·806	·786	·792							

Repts. of Chief of Wthr. Bur., Washington.

KEY WEST, FLA. 24° 34′N 81° 49′W.

Mean of 24 hours reduced to 32° F. and standard gravity. Altitude = 22ft. 29″+

	0	1	2	3	4	5	6	7	8	9
187-	...	...	..	1·000	1·004	1·024	1·016	·974	·936	·935
188-	1·001	·974	1·008	1·001	·989	·981	·973	·986	·995	·991
189-	1·018	·994	1·013	·989	1·016	1·000	1·010	1·001	1·002	1·000
190-	·997	·981	·984	·980	·996	·987	·992	1·016	1·006	·986
191-	1·014	1·014	·996							

Repts. of Chief of Wthr. Bur., Washington.

LEH 34° 10′N 77° 42′E.

Mean of 10 and 16 hours reduced to 32° F., and standard gravity. Altitude = 11, 503 ft. 19″+

	0	1	2	3	4	5	6	7	8	9
187-	...	...	..	...	...	...	...	·631	·630	·620
188-	·642	·644	·624	·601	·631	·616	·596	·617	·635	·645
189-	·610	·641	·651	·606	·621	·689	·671	...	·661	·688
190-	·634	·684	·694	·672	·604	·634	·647	·655	·657	·649
191-	·640	·651								

Deptl. records.

LISBON 38° 43′N 9° 9′W.

Mean of 24 hours reduced to 0°C. Altitude = 95·4 m. Grav. corr. not applied. 760 mm.+

	0	1	2	3	4	5	6	7	8	9
185-	...	...	...	...	...	4·90	4·78	5·14	4·84	6·00
186-	4·92	4·59	4·68	6·36	3·67	5·05	5·28	4·91	6·01	5·04
187-	3·75	4·51	4·09	5·23	5·75	5·29	4·22	5·27	4·98	5·01
188-	5·50	4·18	6·82	5·76	5·09	4·26	4·71	4·40	4·89	5·85
189-	4·81	5·08	3·68	4·53	5·43	3·38	5·97	5·95	5·34	5·05
190-	5·54	4·48	4·97	6·10	5·64	6·09	5·98	5·54	6·03	4·72
191-	5·75									

1855-1895, Haun's paper in Penck's Geogr. Abh. II. 2 pp. 203,1.
1896-1910, Anns. Obs. d. Infante. d. Luiz.

LUGANSK 48° 35′N 39° 20′E.

Reduced to 0°C. altitude 45 m. and standard gravity. 750 mm. +

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	4·7	5·1	4·4	5·8	6·1	4·9	5·6
188-	6·0	7·0	6·5	7·5	7·2	9·6	10·1	8·9	8·4	9·7
189-	10·1	10·4	9·1	8·9	9·8	8·7	9·8	9·5	9·9	8·9
190-	9·0	9·4	9·4	9·5	9·0	9·4	8·4	...	...	...

Anns. de l'Obs. Phys. Centr. de Russie.

MADRAS 13° 4′N 80° 14′E.

8 A.M. reduced to 32° F. and standard gravity. Altitude = 22 ft. 29"+

	0	1	2	3	4	5	6	7	8	9
184-	...	...	·813	·823	·816	·838	·833	·811	·812	·796
185-	·812	.813	·824	·825	·821	·839	·826	·829	·835	·834
186-	·812	·806	·806	·809	·851	·842	·822	·832	·831	·802
187-	·792	·815	·806	·818	·814	·814	·813	·866	·826	·805
188-	·814	·822	·806	·816	·840	·840	·814	·810	·836	·814
189-	·809	·828	·797	·817	·806	·823	·828	·810	·805	·826
190-	·828	·817	·828	·809	·824	·831	·810	·812	·813	·804
191-	·793	·818	·820	·816						

Deptl. records.

MANAOS 3° 0′S 60° 0′W.

Reduced to 0°C. 750 mm. +

	0	1	2	3	4	5	6	7	8	9
190-	...	...	5·8	4·5	5·9	5·4	...	5·3	5·3	5·6
191-	4·8	4·9	4·0							

Mss. from the Director, Rio-de-Janeiro.

MANILA 14° 35′N 120° 58′ E.

Mean of 24 hours reduced to 0°C. Altitude = 14·2m. Grav. corr. not applied. 750 mm +

	0	1	2	3	4	5	6	7	8	9
188-	9·45	9·61	9·35	9·49	9·95	10·49	9·84	9·19	9·54	9·42
189-	8·96	9·40	8·90	9·06	8·95	9·01	9·33	9·19	8·24	8·83
190-	9·22	9·13	9·32	9·18	8·69	9·46	8·72	8·71	8·67	8·54
191-	8·58	8·93	9·2[illegible]	9·20						

Metl. Obns., Manila and mss.

MEXICO 19° 26′ N 99° 8′ W.

Mean of 24 hours reduced to 0°C. Altitude = 2,280 m. Grav. corr. not applied. 580 m m +

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	...	...	...	...	...	6·48	6·96
188-	6·82	6·69	7·09	6·42	5·79	6·05	6·02	6·01	6·13	6·34
189-	6·45	6·01	6·01	6·04	6·33	6·01	6·28	6·24	5·75	5·67
190-	5·67	5·83	5·55	6·50	6·56	5·67	6·76	6·79	6·88	6·71
191-	6·80	6·78								

Bol. Men. Obs. Metl. Magn. Cent. de Mexico.

MOSKOW 55° 46′ N 37° 40′ E.

Reduced to 0°C. altitude 160·2 m. and standard gravity. 740 mm. +

	0	1	2	3	4	5	6	7	8	9
187-	...	9·1	9·9	7·7	8·4	9·2	9·6	10·4	7·4	8·8
188-	7·7	8·2	8·7	10·1	9·8	9·4	11·1	8·5	8·5	10·8
189-	10·6	10·6	9·1	8·0	8·9	7·3	8·3	8·2	7·6	6·2
190-	8·1	7·7	6·2	7·2	7·6	7·0	6·8	8·5	7·4	

Anns. de l'Obs. Phys. Centr. de Russie.

NAGASAKI 32° 44′ N 129° 52′ E.

Mean of 2, 6, 10 A.M. and 2, 6, 10 P.M. reduced to 0°C and altitude 133 m. Grav. corr. not applied. 740 mm. +

	0	1	2	3	4	5	6	7	8	9
188-	...	...	...	...	...	...	10·9	10·3	10·1	...
189-	9·8	10·8	10·5	11·1	11·1	10·5	11·0	10·9	10·0	10·6
190-	10·7	10·1	10·4	10·9	11·0	10·5	10·1	10·2	10·7	10·5
191-	10·3	11·0	11·6	...	...	...	...	...	...	...

Metl. Repts., Japan.

NASHVILLE, TENN 36° 10′ N 86° 47′ W.

Mean of 24 hours reduced to 32° F. and standard gravity. Altitude = 546 ft. 29"+

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	·471	·498	·463	·465	·471	·420	·502
188-	·502	·460	·476	·486	·460	·449	·453	·459	·476	·495
189-	·494	·486	·484	·452	·490	·478	·495	479	·476	·493
190-	·489	·476	·475	·501	·501	·501	·507	·497	·499	·489
191-	·491	·520	·504							

Repts. of Chief of Wthr. Bur., Washington.

NERTCHINSK (ZAVOD) 51° 19′ N 119° 37′ E.

Reduced to 0°C altitude 621 m. and standard gravity. 700 mm. +

	0	1	2	3	4	5	6	7	8	9
185-	...	6·6	6·0	5·6	6·3	5·8	6·0	6·5	5·6	6·1
186-	6·3	6·0	6·6	5·5	5·9	6·3	5·9	5·1	6·6	5·4
187-	6·3	6·3	6·3	6·3	5·7	6·4	...	6·7	6·5	5·2
188-	7·1	6·0	6·9	6·2	5·7	5·2	...	5·1	5·4	5·4
189-	5·3	5·6	6·3	7·0	7·0	6·1	6·8	6·5	6·5	6·6
190-	6·7	7·0	6·2	6·2	5·8	5·9	6·1	5·8	5·1	...

Anns. de l'Obs. Phys. Centr. de Russie.

NEWCASTLE 18° 6′ N 76° 42′ W.

9 A.M. reduced to 32° F. Altitude = 3,000 ft. time corr. not applied. 26" +

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	...	...	...	...	...	·316	·321
188-	...	·316	·359	·361	·353	·346	·307	...	...	...
189-	·121	·197	·335	347	·380	·329	·326	·416	·511	·566
190-	·395	·215	·343	·451	·395					

1876-1883 Med. Obns. Foreign and Col. stations 1852-80. London 1889, pp. 134-138.

1890-1901. Army Med. Dept. Repts., London.

NIKOLAEVSK 53° 8′ N 140° 45′ E.

Reduced to 0° C. altitude 32·5 m. and standard gravity. 750 mm. +

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	...	...	...	...	...	...	7·1
188-	7·8	6·4	7·2	...	...	...	4·9	5·2	3·8	4·2
189-	7·0	6·0	5·3	6·3	7·3	6·8	6·8	6·8	...	6·7
190-	...	6·9	7·8	7·7	7·1	...	7·0	6·1	7·4	...

Anns. de l'Obs. Phys. Centr. de Russie.

PALERMO 38° 7′ N 13° 21′ W.

Mean of 9, 15, 21, hours reduced to 0° C. Altitude = 72·2 m. Grav. corr. not applied.
750 mm. +

	0	1	2	3	4	5	6	7	8	9
185-	...	4·35	4·08	2·83	4·69	3·75	4·68	4·73	4·23	4·84
186-	3·49	4·02	4·23	5·49	3·83	4·23	4·74	4·20	4·55	4·50
187-	3·70	4·18	4·28	4·36	4·43	4·23	4·11	4·07	4·08	4·27
188-	5·77	4·23	5·61	4·23	5·18	3·77	4·0	4·4	4·9	3·9
189-	4·1	4·8	4·1	4·1	4·5	3·6	4·3	4·9	4·7	...
190-	...	...	...	...	...	4·8				

1851-1885 Hann's paper in Penck's Geogr. Abh. II,2 pp. 195,6.

1886-1905 Anns. Met., Italina, Roma.

NOTE.—For the years 1886 onwards, the corr.—1·4 derived from the data 1881-1885 has been applied to make the series uniform with Hann's.

PAPEITI 17° 32′ S 149° 34′ W.

760 mm. +

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	...	...	...	...	...	...	3·9
188-	4·0	2·8	2·1	2·5	2·7	3·1	3·3	3·6	2·4	...

Metl. Zeit 1892, p. 143.

PARA 1° 27′ S, 48° 29′ W.

750 mm.+

	0	1	2	3	4	5	6	7	8	9
189-	...	...	...	...	...	...	9·38	9·43	9·31	9·59
190-	9·31	9·10	9·38	9·42	9·25	9·27	9·4	9·4	9·77	9·5
191-	9·3									

Metl. Zeit 1906, p. 517, 1907 p. 431, 1911 p. 215 and 1914 p. 139.

PELOTAS 31° 49′S 52° 12′W.

Reduced to 0°C. 750 mm+

	0	1	2	3	4	5	6	7	8	9
189-	...	...	...	11·0	10·8	9·8	12·8	11·2	9·2	9·1
190-	9·3	10·3	10·3	11·5	11·9	10·9	11·1	11·5		

Mss. from the Director, Rio-de-Janeiro.

PERTH 31° 57′S 115° 52′E.

9 A.M, reduced to 32°F., sea-level and standard gravity. 30"+

	0	1	2	3	4	5	6	7	8	9
188-	...	...	...	...	...	·050	·084	·067	·074	·024
189-	·011	·081	·045	·003	·061	·059	·050	·061	·026	·052
190-	·048	·063	·088	·040	·053	·078	·030	·043	·074	·042
191-	·016	·071	·048	·059						

Mss. received from the Director.

PETROGRAD 59° 56'N 30° 16'E.

Reduced to O°C, altitude 4·8m. and standard gravity. 750 mm+

	0	1	2	3	4	5	6	7	8	9
185-	...	10·4	0·2	11·2	7·4	9·7	6·9	11·1	9·3	8·2
186-	11·1	9·4	11·7	8·2	10·1	10·0	7·7	7·7	9·1	8·7
187-	10·1	9·2	11·3	8·5	8·3	10·7	10·3	9·7	7·0	9·2
188-	8·0	10·1	10·0	10·1	10·9	9·2	11·4	8·7	9·5	11·1
189-	10·6	10·8	9·2	8·1	9·2	9·6	10·7	10·7	9·3	7·9
190-	9·8	10·1	8·8	8·6	9·9	8·8	8·9	10·9	10·2	

1851-1885, Hann's paper in Penck's Geogr. Abh. II, 2, pp. 212,3.

1886-1908 Anns. de l'Obs. Phys. Centr. de Russie.

PONTA DELGADA 37° 45'N 25° 41'W.

Mean of 24 hours reduced to O°C. Altitude=27m. Grav. corr. not applied. 760 mm. +

	0	1	2	3	4	5	6	7	8	9
189-	...	...	...	...	5·27	2·52	5·96	5·09	3·95	3·00
190-	5·35	4·45	3·58	5·35	5·08	5·03	6·32	6·44	6·48	4·52
191-	6·23	5·44	4·87							

Ann. do Obs. do. Infante d'Luiz, Lisboa.

PORT DARWIN 12° 28'S 130° 51'E.

9 A.M. reduced to 32° F., sea-level and standard gravity. 29" +

	0	1	2	3	4	5	6	7	8	9
188-	...	...	·823	·831	·859	·877	·823	·836	·879	·842
189-	·825	·876	·837	·835	·836	·848	·870	·859	·827	·879
190-	·884	·881	·906	·866	·869	·903	·906	·867	·867	·835
191-	·838	·885	·893	·893						

Mss. received from the Director.

PORT LOUIS (MAURITIUS) 20° 0'S 57° 35'E.

Daily mean reduced to 32°F. Altitude = 181 ft. Grav. corr. not applied. 29"+

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	...	...	·896	·907	·918	·882	·902
188-	·940	·923	·900	·886	·879	·890	·899	·906	·905	·912
189-	·893	·905	·877	·901	·908	·879	·904	·880	·871	·901
190-	·905	·896	·861	·870	·901	·872	·883	·882	867	·880
191-	·876	·877	·878	·885						

Mauritius Metl. results and Deptl. records.

PUNTA ARENAS 53° 10'S 70° 54'W.

740mm. +

	0	1	2	3	4	5	6	7	8	9
188-	...	...	...	...	...	...	...	...	...	11·05
189-	9·00	8·75	9·11	9·21	8·92	6·32	6·88	8·62	9·16	7·21
190-	8·72	9·35	7·46	6·82	8·83	8·03	7·96	9·59		

Obs. del Colejio Salesiano de Punta Arenas de Magallanes (Chili).

RANGOON 16° 46'N 96° 12'E.

8 A. M. reduced to 32°F. and standard gravity. Altitude = 18 ft. 29"+

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	...	...	...	·826	·875	·832	·809
188-	·836	·833	·827	·830	·852	·856	·837	·837	·853	·840
189-	·833	·833	·813	·829	·823	·827	·834	·827	·812	·834
190-	·836	·825	·835	·842	·831	·841	·834	·826	·824	·816
191-	·813	·836	·843	·842						

Deptl. records.

RECIFE 8° 5'S 34° 50'W.

Reduced to 0°C. 750mm+

	0	1	2	3	4	5	6	7	8	9
188-	...	...	...	...	...	...	...	10·8	11·7	11·0
189-	10·1	8·9	8·3	8 7	9·1	9·1	8·8	9·3	...	...
190-	9·0	9·7	9·9	10·2	9·9	10·0	8·9	9·7	9·7	...
191-	...	9·8	9·8							

Mss. from the Director, Rio-de-Janeiro.

RIO-DE-JANEIRO 22° 54'S 43° 10'W.

Daily mean reduced to 0°C. Altitude=66m. Grav. corr. not applied. 750 mm +

	0	1	2	3	4	5	6	7	8	9
185-	...	·691	7·51	7·28	10·87	7·54	7·53	6 94	5·69	5·76
186-	5·98	6·24	6·61	6·32	6·07	7·09	7·53	7·77	6·93	7·30
187-	7·13	6·61	6·97	6·75	7·61	7·92	7·65	6·78	7·53	8·15
188-	8·14	8·03	8·43	8·76	8·58	7·92	7 67	7·43	7·65	7·25
189-	7·63	7·01	7·11	7·58	7·71	7·77	7·82	7·97	7·33	6·75
190-	7·72	7·52	6·46	7·25	7·44	7·35	7·18	7·76	7·51	7·26

1851-1890 O Clima do Rio-da-Janeiro 1892, p. 27.

1891-1909 Bol. Men. do. Obs. Rio-de-Janeiro.

ST. HELENA 15° 55'S 5° 43'W.

9 a.m. reduced to 32°F. sea-level and standard gravity. 29"+

	0	1	2	3	4	5	6	7	8	
189-	...	...	...	·924	·932	·926	·935	·940	·929	·923·
190-	·913	·910	·939	·914	·954	·927	·957	·956	·956	

Trade winds of the Atlantic Ocean by M. W. Campbell Hepworth 1910, p. 19.

SAN DIEGO, CAL 32° 43'N 117° 10'W.

Mean of 24 hours reduced to 32°F, and standard gravity. Altitude=87ft. 29"+

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	·904	·912	·921	·896	·878	·871	·895
188-	·917	·851	·889	·885	·863	·863	·876	·878	·866	·880
189-	·904	·889	·886	·894	·917	·886	·895	·888	·863	·884
190-	·868	·874	·876	·884	·881	·854	·874	·891	·902	·898
191-	·905	·897	·902							

Repts. of Chief of Wthr. Bur., Washington.

SANTIAGO 33° 27'S 70° 41W.

Mean of 7, 14 and 21 hours reduced to 0°C and standard gravity. Altitude=520m. 710mm+

	0	1	2	3	4	5	6	7	8	9
186-	...	6·62	6·67	6·33	6·20	6·43	6·41	6·52	6·08	6·50
187-	6·44	6·41	7·32	7·11	6·92	6·40	6·77	6·28	6·38	6·45
188-	6·03	6·26	6·32	6·08	5·91	6·05	6·59	6·00	5·75	6·31
189-	6·51	6 35	6 67	6·84	6·73	6·49	6·15	6·41	6·27	6·29
190-	6·01	6·38	6·10	6·37	6·05	6·03	6·69	6·41	6 66	6·72
191-	6 50	6·60	6·60	6·60						

Mss. from the Director.

SCUTARI 41° O'N 29° 3'E.

Mean of 9 a.m. and 3 p.m. reduced to 32°F. Altitude=60ft. Grav. corr. not applied. 29"+

	0	1	2	3	4	5	6	7	8	9
186-	...	...	...	...	...	·926	·926	·916	...	·931
187-	·900	·913	·919	·932	·928	·910	·885	...	·873	·873
188-	·930	·896	·927	·879	·921	·892	·898	·918	·897	·879
189-	·892	·939	·871	·878	·905	·857	·905	·934	·915	·908
190-	·876	·880	·907	·902	·894					

1865-1885 Metl. Obns. Foreign and Col. stations 1852-80, London 1890, pp. 84-91.

1886-1904 Army Med. Dept. Repts. London.

SEYCHELLES, 4° 45'S 55° 45'E.

Mean of 10 and 16 hours reduced to 32°F. Altitude=15 ft. Grav. corr. not applied. 29"+

	0	1	2	3	4	5	6	7	8	9
189-	...	...	...	...	...	·943	·952	·935	·922	·954
190-	·955	·950	·936	·939	·938	·953	·932	·949	·945	·947
191-	·939	·952	·945	·953						

Deptl. records.

SIERRA LEONE 8° 30'N 13° 9'W.

Mean of 9 a.m. and 3 p.m. reduced to 32°F. Altitude=221 ft. Grav. corr. not applied. 29"+

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	...	...	...	...	·716	·722	·714
188-	...	...	·675	...	...	·695	·667	·657	·674	...
189-	...	·671	...	...	·721	·749	·720	·700	·703	·702
190-	·722	·721	·731	·721	·743					

1877-1885 Metl. Obns. Foreign and Col. stations 1852-80, London 1890, pp. 162-166.

1886-1904 Army Med. Dept. Repts., London.

THORSHAVN 62° 22'N 6° 44' W.

Mean of 8 a.m., 2 p.m., and 9 p.m., reduced to 0°C. altitude 25·7 m. and standard gravity. 750 mm.+

	0	1	2	3	4	5	6	7	8	9
186-	...	...	...	...	...	...	...	5·72	1·63	4·04
187-	6·59	5·05	2·48	4·08	2·44	6·21	4·31	2·29	5·55	5·60
188-	5·70	5·32	3·45	3·77	3·29	3·16	3·4	5·4	6·9	1·6
189-	3·5	4·1	4·5	4·3	3·5	5·1	6·3	4·6	3·0	4·9
190-	4·1	5·4	5·6	1·8	2·8	4·2	3·8	3·6	6·0	4·4
191-	3·3	4·9	3·7							

1867-1885 Hann's paper in Penck's Geogr. Abh. II, 2 p. 219.

1886-1912 Ann. Metn. Danois.

TIFLIS 41° 43'N 44° 48'E.

Reduced to 0°C. and standard gravity. Altitude=403·8 m. 720mm.+

	0	1	2	3	4	5	6	7	8	9
185-	...	8·1	7·7	8·2	7·2	7·4	7·1	7·8	7·8	7·2
186-	7·3	7·2	7·7	7·9	7·7	7·2	7·3	7·0	7·0	7·9
187-	7·1	6·9	7·9	7·0	7·1	6·2	7·0	7·3	6·4	6·6
188-	7·3	6·9	7·2	7·4	7·6	7·4	7·8	7·6	7·0	7·8
189-	7·7	8·0	7·0	7·0	7·6	6·8	7·5	7·2	7·8	7·6
190-	7·7	7·6	7·5	7·8	7·5	7·5	7·0	7·4	7·5	

1851-73 Hann's paper in Penck's Geogr. Abh. II, 2 p. 191.

1874-08 Anns. de l' Obs. Phys. Centr. de Russie.

TOKIO 35° 41'N 139° 45'E.

Mean of 2, 6 and 10 a.m., and 2, 6 and 10 p.m., reduced to 0°C. sea-level and standard gravity. 750 mm. +

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	11·1	11·2	9·7	11·0	11·3	10·9	10·4
188-	10·7	10·8	10·9	10·8	10·7	10·7	11·0	10·4	10·5	10·7
189-	10·5	10·7	10·5	10·7	11·0	10·5	11·0	11·2	10·7	10·9
190-	11·1	10·4	10·7	11·2	10·8	11·2	10·3	10·7	10·9	10·7
191-	10·1	11·3								

Metl. Obns. Japan.

TORONTO 43° 29'N 79° 23'W.

Mean of 24 hours reduced to 32°F. Altitude=350 feet. Grav. corr. not applied. 29"+

	0	1	2	3	4	5	6	7	8	9
184-	...	·604	·612	·612	·618	·610	·628	·625	·620	·668
185-	·616	·645	·589	·631	·608	·626	·600	·606	·627	·622
186	·593	·602	·625	·634	·560	·634	·622	·615	·643	·598
187-	·597	·607	·609	·597	·645	·614	·602	·635	·595	·625
188-	·636	·632	·652	·650	·627	·593	·626	·633	·645	·618
189-	·632	·639	·633	·600	·625	·617	·636	·639	·652	·637
190-	·621	·599	·594	·620	·638	·627	·658	·617	·626	·632
191-	·607	...	·604							

Magn. and Metl. Obns. Toronto.

VALENCIA 51° 56′N 10° 15′W.

Mean of 24 hours reduced to 32°F. and altitude 45 ft. Grav. corr. not applied. 29″+

	0	1	2	3	4	5	6	7	8	9
186-	...	...	...	...	...	...	...	...	...	·927
187-	·934	·884	·717	·908	·918	·905	·817	·828	·897	·889
188-	·929	·867	·869	·900	·914	·874	·860	1·002	·914	·959
189-	·918	·893	·891	·922	·879	·849	·997	·862	·927	·891
190-	·865	·913	·896	·799	·879	·925	·936	·898	·956	·907
191-	·826	·911	·798	·803						

Wthr. Repts. London.

VARDÖ 70° 22′N 31° 8′E.

Daily mean reduced to 0°C. and standard gravity. Altitude=10 m. 750 mm.+

	0	1	2	3	4	5	6	7	8	9
186-	...	...	...	...	...	...	6·5	5·7	5·4	4·2
187-	6·7	5·3	9·1	5·9	3 5	7·4	6·7	5·3	4·0	6·9
188-	3·4	5·6	6·0	7·0	6·8	6·3	6·5	3·5	6·2	7·2
189-	6·4	6·3	6·0	4·4	5 0	6·6	6·6	7·6	6·4	5·5
190-	6·1	6·3	5·9	4·2	5·9	4·4	5·0	5·9	6·0	5·8
191-	6·2	4·9	6·9							

1866-1895 Klima Tabeller for Norge 1896, p. 76.

1896-1912 Jahrb. Norweg. Metn. Inst.

VICTORIA, B. C. 48° 24′N 123° 19′W.

Mean of 24 hours reduced to 32°F. and sea-level. Grav. corr. not applied. 29″+

	0	1	2	3	4	5	6	7	8	9
189-	...	·98	...	1·01	1·01	1·03	1·00	1·02	1·00	·99
190-	·99	1·03	·97	1·03	·98	1·01	·99	·99	1·03	·98
191-	1.03	1·05	1·03							

M. W. R. Canada.

VIENNA 48° 15′N 16° 21′E.

Reduced to 0°C. Altitude=202 m. Grav. corr. not applied. 740 mm+

	0	1	2	3	4	6	6	7	8	9
185-	...	4·16	3·51	2·20	4·12	2·77	3·48	5·27	5·09	4·12
186-	2·33	4·61	4·07	5·09	4·36	4·47	3·62	3·46	4·00	4·05
187-	3·71	4·11	2·66	4·02	4·21	4·21	3·18	3·36	2 80	3·04
188-	4·52	4·34	4·54	4·37	4·79	3·50	3·39	4·50	3·95	3·53
189-	4·15	4·66	3·46	4·24	4·51	2·78	4 41	4·43	4·42	4·63
190-	3·36	3·59	4·23	4·14	4·41	4·35	3·83	4·35	5·18	2·97
191-	2·31									

1851-1900 Denkschriften der Kaiserlichen Akad. d. Wiss. 1901, p.41.

1901-1910, Jahrb. d. K. K. Zentral-Anstalt für. Mety. und Geodynamik, Wien.

WARSAW 52° 13'N 21° 2'E.

Reduced to 0°C. altitude 120·7m., and standard gravity. 740 mm+

	0	1	2	3	4	5	6	7	8	9
185-	9·6	10·8	10·2	10·0	9·7	10·1	9·9	12·6	12·2	10·4
186-	9·3	10·8	11·7	11·4	11·1	11·2	9·6	9·3	10·6	10·7
187-	10·9	11·1	10·2	10·5	10·6	11·0	10·3	10·0	9·2	10·1
188-	10·0	11·7	11·1	11·0	11·6	10·6	10·0	10·7	10·5	10·3
189-	11·1	11·3	10·2	10·3	11·0	10·0	11·4	11·5	11·0	10·3
190-	10·5	10·6	11·0	10·8	11·9	11·3	10·7	11·6	13·2	

1850-1885 Hann's paper in Penck's Geogr. Abh. II. 2, pp. 210, 1.
1886-1903 Anns. de l'Obs. Phys. Centr. de Russie.

WASHINGTON, D.C. 38° 54'N 77° 3'W.

Mean of 24 hours reduced to 32°F. sea-level and standard gravity. 30"+

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	·06	·10	·08	·06	·07	·00	·07
188-	·09	·05	09	·02	·06	·03	·05	·02	·06	·04
189-	·06	·07	·06	·04	·06	·05	·07	·06	·05	·07
190-	·05	·02	·03	·06	·09	·06	·07	·05	·07	·04
191-	·03	·09	·05							

M. W. R. Washington.

WINNIPEG, MAN. 49° 51'N 97° 7'W.

Mean of 24 hours reduced to 32°F, and sea-level. Grav. corr. not applied. 29"+

	0	1	2	3	4	5	6	7	8	9
189-	..	1·00	1·01	·99	·97	·98	1·01	1·00	·97	·99
190-	1·01	1·06	...	...	1·03	1·00	1·02	1·01	·99	1·02
191-	1·01	1·02	·99							

M. W. R. Canada.

ZANZIBAR 6° 10'S 39° 11'E.

8 a.m. reduced to 32°F and standard gravity. Altitude=72ft. 29"+

	0	1	2	3	4	5	6	7	8	9
189-	...	...	·901	·914	·907	·920	·919	·934	·901	·927
190-	·926	·927	·910	·907	·920	·903	·926	·921	·910	·917
191-	·913	·932	·925	·925						

Dept. records.

ZI-KA-WEI 31° 12N 119° 6'E.

Mean of 24 hours reduced to 0°C. Altitude=7 m Grav. corr. not applied. 760mm+

	0	1	2	3	4	5	6	7	8	9
187-	...	...	...	2·68	2·88	2·54	2·54	3·20	3·45	2·41
188-	3·39	2·93	3·12	3·12	3·17	3·08	3·20	2·73	2·22	2·85
189-	2·20	2·63	2·83	3·08	2·74	2·98	2·67	2·67	2·20	2·80
190-	2·95	2·80	2·27	2·86	2·80	2·44	2·27	2·41	2·66	2·66

Bull. des. Obns. Zi-ka-Wei, Tome XXXV.

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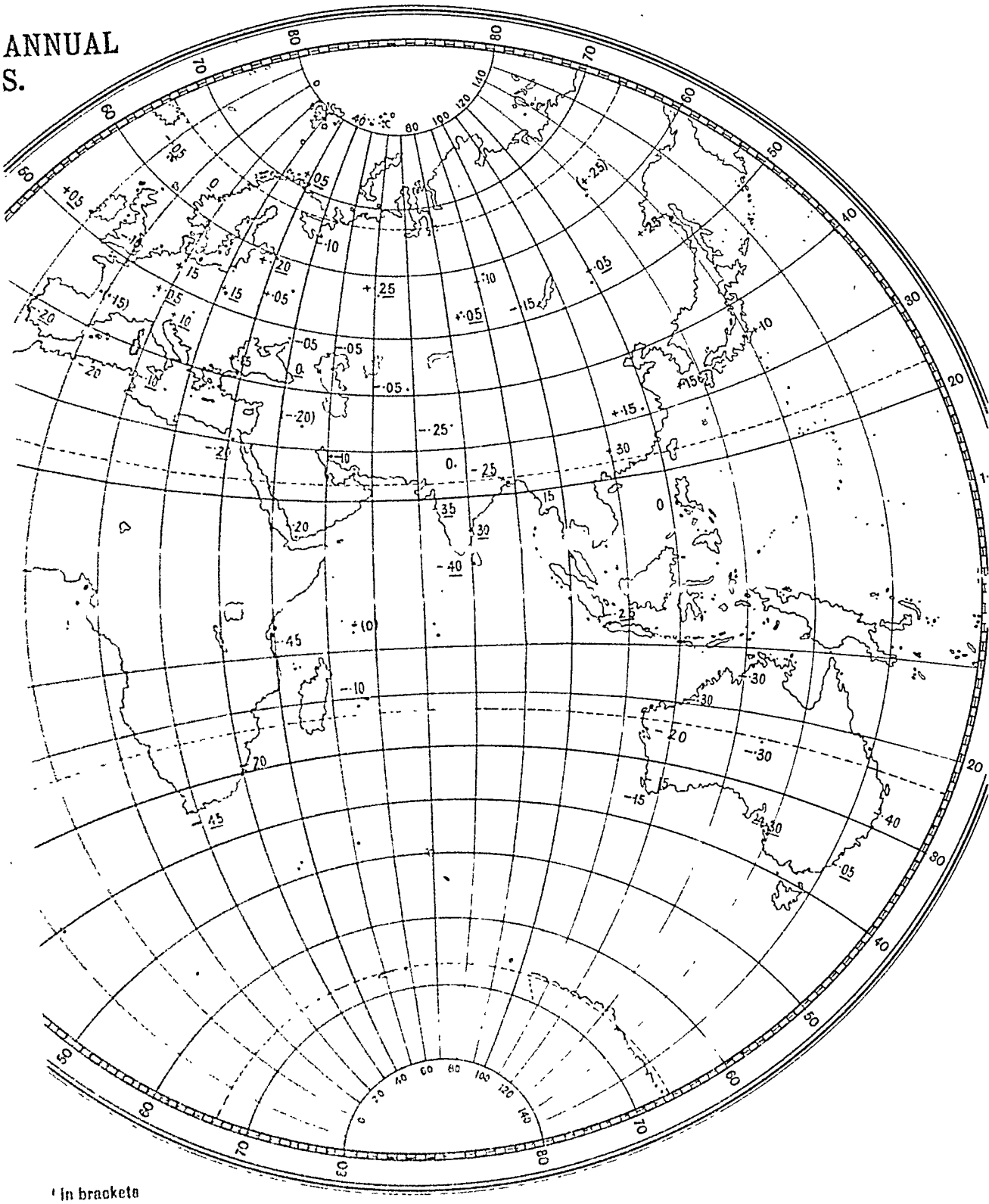

( ) In brackets